WHAT IS CLAIMED IS:

1. An optical signal monitoring method for measuring the characteristics of a wavelength division multiplexing (WDM) optical signal, comprising the steps of:

combining the WDM optical signal with reference lights to form a combined optical signal;

inputting the combined optical signal to a filter that has a variable transmission wavelength according to an applied driving voltage;

obtaining a linear approximated wavelength with respect to a driving voltage from predetermined wavelengths of the reference lights and driving voltages corresponding to the predetermined wavelengths; and

obtaining a non-linear compensated wavelength from a predetermined non-linear compensation formula with the driving voltage to compensate for a discrepancy between a transmission wavelength of the filter and the linear approximated wavelength.

2. The optical signal monitoring method of claim 1, wherein the linear approximated wavelength is determined by:

$$x = \frac{X_1 - X_2}{V_1 - V_2}(v - V_1) + X_1 \ldots\ldots (5)$$

where x is the linear approximated wavelength, X_1 is a first predetermined wavelength, V_1 is a first driving voltage, X_2 is a second predetermined wavelength, V_2 is a second driving voltage, and v is the driving voltage related with x.

3. The optical signal monitoring method of claim 1, wherein the non-linear compensation formula is expressed as:

$$y = x + (x - X_1)(x - X_2)\sum_{m=0}^{M} a_m x^m Ax + (x - X_1)(x - X_2)P_M(x) \ldots\ldots (6)$$

where y is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary constant, and a_m is an m^{th}-order non-linear coefficient.

4. The optical signal monitoring method of claim 2, wherein the non-linear compensation formula is expressed as:

$$y = x + (x - X_1)(x - X_2)\mathop{Q}_{m=0}^{M} a_m x^m Ax + (x - X_1)(x - X_2)P_M(x) \ \ldots\ldots (7)$$

where y is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary integer, and a_m is an m^{th}-order non-linear coefficient.

5. The optical signal monitoring method of claim 1, wherein the filter is a fiber Fabry-Perot filter.

6. The optical signal monitoring method of claim 1, wherein the reference lights are combined at both sides of the WDM optical signal on the wavelength spectrum representing light intensities at particular wavelengths.

7. The optical signal monitoring method of claim 1, which further includes deriving a driving voltage-light intensity graph of a combined optical signal detected from the filter in the overall wavelength band of the combined optical signal.

8. An optical signal monitoring method for measuring the characteristics of an input wavelength division multiplexing (WDM) optical signal, comprising the steps of:

combining the WDM optical signal with reference lights to form a combined optical signal;

inputting the combined optical signal to a filter that has a variable transmission wavelength according to an applied driving voltage;

obtaining a linear approximated wavelength with respect to a driving voltage from predetermined wavelengths of the reference lights and driving voltages corresponding to the predetermined wavelengths;

sensing the operation temperature of the filter; and

obtaining a non-linear compensated wavelength from a predetermined non-linear compensation formula with the driving voltage and the operation temperature of the filter to compensate for a discrepancy between a transmission wavelength of the filter and the linear approximated wavelength.

9. The optical signal monitoring method of claim 8, wherein the linear approximated wavelength is determined by:

$$x = \frac{X_1 - X_2}{V_1 - V_2}(v - V_1) + X_1 \ldots\ldots (8)$$

where x is the linear approximated wavelength, X_1 is a first predetermined wavelength, V_1 is a first driving voltage, X_2 is a second predetermined wavelength, V_2 is a second driving voltage, and v is the driving voltage related with x.

10. The optical signal monitoring method of claim 8, wherein the non-linear compensation formula is expressed as:

$$\lambda = x + (x - X_1)(x - X_2)\sum_{m=0}^{M}\sum_{n=0}^{N} c_{m,n} x^m t^n Ax + (x - X_1)(x - X_2)P_{MN}(x,t) \ldots\ldots (9)$$

where λ is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary integer, N is an arbitrary integer, $c_{m,n}$ is an $(m, n)^{th}$-order

non-linear coefficient, and t is the product of the driving voltage related with x and the operation temperature of the filter.

11. The optical signal monitoring method of claim 8, wherein the non-linear compensation formula is expressed as:

$$\lambda = x + (x - X_1)(x - X_2)\sum_{m=0}^{M}\sum_{n=0}^{N} c_{m,n} x^m t^n Ax + (x - X_1)(x - X_2)P_{MN}(x,t) \ldots\ldots (10)$$

where λ is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary integer, N is an arbitrary integer, $c_{m,n}$ is an $(m, n)^{th}$-order non-linear coefficient, and t is the product of the driving voltage related with x and the operation temperature of the filter.

12. The optical signal monitoring method of claim 8, wherein the filter is a fiber Fabry-Perot filter.

13. The optical signal monitoring method of claim 8, wherein the reference lights are combined at both sides of the WDM optical signal on the wavelength spectrum representing light intensities at particular wavelengths.

14. The optical signal monitoring method of claim 8, which further includes deriving a driving voltage-light intensity graph of a combined optical signal detected from the filter in the overall wavelength band of the combined optical signal.

15. An optical signal monitoring apparatus for measuring the characteristics of a wavelength division multiplexing (WDM) optical signal, comprising:

an optical coupler for combining the WDM optical signal with reference lights to form a combined optical signal;

a filter for passing only an optical signal at a predetermined wavelength from the combined optical signal received from the optical coupler according to a driving voltage;

a filter driver for feeding a driving voltage that linearly varies according to an input driving signal;

an optical detector for opto-electrically converting the optical signal received from the filter to an optical detection signal;

a temperature sensor for sensing the operation temperature of the filter and outputting a temperature sensed signal representing the sensed operation temperature; and

a controller for receiving the optical detection signal and the temperature sensed signal, outputting the driving signal to the filter driver, obtaining a linear approximated wavelength with respect to the driving voltage from predetermined wavelengths of the reference lights and driving voltages corresponding to the predetermined wavelengths, and obtaining a non-linear compensated wavelength from a predetermined non-linear

compensation formula with the driving voltage and the operation temperature of the filter to compensate for a discrepancy between a transmission wavelength of the filter and the linear approximated wavelength.

16. The optical signal monitoring apparatus of claim 15, wherein the linear approximated wavelength is determined by:

$$x = \frac{X_1 - X_2}{V_1 - V_2}(v - V_1) + X_1 \ldots\ldots (11)$$

where x is the linear approximated wavelength, X_1 is a first predetermined wavelength, V_1 is a first driving voltage, X_2 is a second predetermined wavelength, V_2 is a second driving voltage, and v is the driving voltage related with x.

17. The optical signal monitoring apparatus of claim 15, wherein the non-linear compensation formula is expressed as:

$$\lambda = x + (x - X_1)(x - X_2)\sum_{m=0}^{M}\sum_{n=0}^{N} c_{m,n} x^m t^n Ax + (x - X_1)(x - X_2)P_{MN}(x,t) \ldots\ldots (12)$$

where λ is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary integer, N is an arbitrary integer, $c_{m,n}$ is an $(m, n)^{th}$-order non-linear coefficient, and t is the product of the driving voltage related with x and the operation temperature of the filter.

18. The optical signal monitoring apparatus of claim 15, wherein the non-linear compensation formula is expressed as:

$$\lambda = x + (x - X_1)(x - X_2)\sum_{m=0}^{M}\sum_{n=0}^{N} c_{m,n} x^m t^n Ax + (x - X_1)(x - X_2)P_{MN}(x,t) \ldots\ldots (13)$$

where λ is the non-linear compensated wavelength, x is the linear approximated wavelength, X_1 is a first predetermined wavelength, X_2 is a second predetermined wavelength, M is an arbitrary integer, N is an arbitrary integer, $c_{m,n}$ is an $(m, n)^{th}$-order non-linear coefficient, and t is the product of the driving voltage related with x and the operation temperature of the filter.

19. The optical signal monitoring apparatus of claim 15, wherein the filter is a fiber Fabry-Perot filter.

20. The optical signal monitoring apparatus of claim 15, wherein the reference lights are combined at both sides of the WDM optical signal on the wavelength spectrum representing light intensities at particular wavelengths.